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A MIXED RECORD

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IN BRIEF

The charge has resounded in recent times that the United States intelligence community has chronically and woefully underestimated both the pace and magnitude of the Soviet strategic build-up. Yet, an analysis of the available record of forecasts with respect to eight major Soviet weapons developments—extending from the first Soviet A-bomb explosion in 1949 to the improvements in Soviet ICBM accuracy and yields in the 1970s—shows that the performance has been mixed, consisting of overestimates as well as underestimates, and in at least two instances of predictions that were on or close to the target. Few of the mistakes that have been committed in forecasting can be attributed to errors in intelligence gathering; most of them have been the function of more-or-less inevitable human foibles. With the demise of SALT, estimates of future Soviet strategic programs are apt to be wider off the mark than they would have been under a SALT II Treaty, because the reference points provided by the Treaty for U.S. intelligence have been removed, and precisely because the human element in intelligence evaluation and forecasting is thus again maximized.

"It is . . . a matter of record that the growth of the Soviet ICBM force was underestimated for a decade after the 'missile gap' by the entire intelligence community—including Pentagon 'hawks.'"

Lt. Gen. Daniel O. Graham, USA (Ret.)

"But the history of the past twenty years shows quite the reverse. Few indeed are the instances when the Soviet military threat later turned out to be greater than the estimated 'worst case.' Usually, the government's experts overestimated the danger."

George B. Kistiakowsky

THE death of SALT II turns the focus of U.S. strategic intelligence away from "verification" and back to the old business of "forecasting." SALT provided for some degrees of restraint and certainty: We knew how far the Soviets were allowed to go, and the task was to verify their compliance with these restrictions. Without SALT, there are no limits or guidelines. The United States must rely purely on its skills in strategic forecasting—in projecting the future, including future Soviet strategic intentions and capabilities.

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generally held to the alarmist image of a Soviet Union bent on constant, implacable expansionism. Rather, the intelligence error on the A-bomb hinged on habit and personal intuition. General Groves thought that the Soviets would take twenty years to build the bomb because, like President Truman, he simply did not believe that "those Asiatic" Russians,⁵ valiant though they might be in standing up to the Germans on the battlefield, had the technological talents to duplicate what his scientists at Los Alamos accomplished in four years. The scientists' prediction that the Soviets would have a bomb within four or five years was modeled on their own experience. That is how long it had taken them to build the bomb: It was a fairly straightforward exercise in physics and engineering, of which they deemed their Soviet counterparts quite capable. In the end, intelligence analysts underestimated the development pace for the Soviets because of what the atomic scientist, Isadore Rabi, characterized as a "peculiar kind of psychology": after the initial estimate in 1945 that the Soviets could get a bomb in four or five years, "every year that went by, you kept on saying 'five years.'"

The close prediction of the Soviet Union's H-bomb detonation in 1953 was purely a matter of chance—a very good guess and little more. The principle of radiation pressure, the essence of the H-bomb, was not even demonstrated in the United States until 1951. Indeed, some officials believed the Soviets could get an H-bomb before 1953. In an attempt to encourage President Truman to forge ahead with the American H-bomb project in 1950, General Loper of the AEC's Military Liaison Committee argued in a memorandum to the President that available intelligence (almost nonexistent) was consistent with the theory that the Soviets *already had* the hydrogen bomb.⁶

The Bomber Gap

In 1955, Air Force Intelligence predicted that the Soviets would field a force of 600 to 700 long-range bombers by 1959. The National Intelligence Estimate (NIE) for that year was slightly more modest, predicting about 500 bombers by mid-1960. As it turned out, by mid-1961 the Soviets had deployed only 190 long-range bombers.⁷

Estimates of bombers grew out of a projec-

tion made in 1950—incorporated in a milestone Cold War document called NSC-68—that the Soviets would possess a stockpile of 200 atomic bombs by 1954.⁸ This projection was based, in part, on the rate at which the United States had been able to build bombs. Given this projection and NSC-68's explicit assumption that the Kremlin was bent on expansion and that the United States was the Soviet Union's principal enemy, intelligence agencies naturally began thinking about how the Soviet Union would deliver the bombs to U.S. territory.

In 1954, Western attachés in Moscow observed a new Soviet long-range bomber flying overhead at the May Day military parade. On the basis of this report, U.S. intelligence made some assumptions about when the Soviets had begun development of this bomber and how quickly they might be able to deploy it in significant numbers. A study concluded that the bomber's design had been completed in 1952 and its first prototype flight made in 1953. In accordance with U.S. experience, it was estimated that mass production could not begin before 1956 and a substantial force could not be deployed before 1960.⁹

The next May Day parade, in 1955, rudely upset these calculations, or at least appeared to do so. Although the aviation part of the parade was canceled, Western observers reported seeing as many as twenty of the long-range bombers in the air during parade rehearsals. Intelligence now updated its earliest estimates. The design of the plane was assumed to have been completed two years earlier than the original finding, and mass production to have begun in 1954. If the Soviets could produce twenty aircraft per month over the next three years, then a force of 700 aircraft by 1959 was plausible.¹⁰

Yet, in 1956 and 1957, U-2 flights produced hard evidence that Soviet production rates fell far below the pace that had been estimated by U.S. intelligence two years earlier. Two factors were involved in this error: an intelligence mistake and a misunderstanding of Soviet strategic intentions.

First, unbeknown to the Western attachés, the Soviets were flying the same bombers back and forth in the 1955 parade preparations; the attachés mistakenly counted each overflight as a separate bomber.¹¹ Second, the United States, believing that its own territory was the ultimate

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The first forecast since the deferral of SALT II has been completed and leaked to the press. The new National Intelligence Estimate—NIE 1138-79—reportedly indicates that without SALT II the Soviets could amass about 14,000 highly accurate ICBM warheads by the late 1980s. By contrast, an extension of SALT II beyond its 1985 expiration date would allow the Soviets only about 6,000 such warheads; if SALT II were in effect, therefore, the presumption would be that the Soviets would build up only to that limit.¹ U.S. strategic force planning would be based on this assumption and U.S. intelligence agencies would be concentrating on verifying Soviet compliance. Now, without SALT II, all we have to go on is this new intelligence estimate. Who knows whether it has validity or not? If U.S. policymakers do believe it to be valid, however, then they will have to think about a requisite expansion of U.S. strategic nuclear forces. Tens of billions of dollars potentially ride on a decision of whether or not to trust this intelligence estimate.²

How good is U.S. intelligence at this task of strategic forecasting? As the passages quoted above indicate, this question is highly controversial.³ Over the years, many analysts, particularly those in arms control circles, have contended that we have consistently overestimated Soviet strategic capabilities. More recently, other analysts, not generally associated with arms control, have argued that we have in fact consistently underestimated Soviet strength.

This controversy can, to some extent, be resolved by examining the record. Considering the salient developments in the history of the nuclear arms competition, we can ask if the U.S. intelligence community has been right or wrong in its forecasts—and if wrong, in which direction (too high or too low) it has erred and for what reasons. The key developments have been:

1. The first Soviet explosion of an atomic bomb, 1949.
2. The first Soviet explosion of a hydrogen bomb, 1953.
3. The "bomber gap," 1955-1958.
4. The "missile gap," 1958-1961.
5. Soviet deployment of an anti-ballistic missile (ABM) system, 1962 onward.
6. Soviet deployment of missiles with mul-

tiples independently targetable reentry vehicles (MIRVs), 1965-1974.

7. Soviet intercontinental ballistic missile (ICBM) and submarine-launched ballistic missile (SLBM) deployments, 1962-1969.
8. The rate of improvements in Soviet ICBM accuracy and yield, 1969 onward.

Such an analysis should provide us with some idea of how well U.S. intelligence will be able to estimate future Soviet defense capabilities in the absence of SALT.

The A-Bomb and the H-Bomb

When the Soviets exploded their first atomic bomb in August 1949, the United States had very little information about Soviet nuclear research. Before the detonation, General Leslie Groves, wartime director of the Manhattan Project, predicted that America's atomic monopoly would last twenty years. Scientists involved in the project, on the other hand, believed in 1945 that the Soviets would duplicate the U.S. achievement within five years. The scientists' expectation encouraged the Atomic Energy Commission to establish, through the Air Force, a program for airborne collection of radioactive particles in the atmosphere, which would detect the explosion of any atomic device anywhere in the world. The program began operations in 1948 (and continues to this day).

As the end of the decade approached and no Soviet A-bomb materialized, the year of anticipated danger, from the vantage point of the U.S. intelligence community, receded progressively. Just before the Soviets actually detonated an atomic device in 1949, they were officially expected to do so in 1952 at the earliest.⁴ The hydrogen bomb, set off by the Soviets in 1953, came as less of a surprise: the United States had predicted that the Soviets would achieve that milestone by 1954.

Why did General Groves underestimate, the scientists correctly estimate, and later most analysts underestimate again how soon the Soviets would explode an A-bomb? And why was the H-bomb prediction so close to the mark?

The problem was not one of optimism about Soviet intentions. Indeed, in the first five years after the war, official circles in Washington

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target of the Soviet Union's nuclear ambitions, naturally assumed that the Soviets would produce intercontinental bombers at the fastest rate possible. However, the Soviets apparently decided that the principal threat to the Soviet Union lay around the periphery of the Soviet landmass, whence Russia had historically been threatened and where the United States happened to be stationing its own nuclear strike forces. Thus, the Soviets used most of their production capacity to build medium-range bombers rather than a long-range force.¹²

The Missile Gap

The Soviet Union launched its first orbital satellite in October 1957.¹³ Although the CIA had foreseen this development years in advance, the actual launching triggered fears that the United States would soon be vulnerable to an ICBM attack. Sputnik: the very word evoked a nightmare vision of the Soviets outpacing the Americans in missile technology. Khrushchev exploited this American fear by publicly making outrageous statements about the capabilities of Soviet missiles which he knew at the time—and we know only in retrospect—to be false.

Air Force Intelligence warned in a November 1957 NIE that the Soviets could deploy 500 ICBMs by the middle of 1960 and 1,000 by 1961. The CIA believed a more reasonable estimate to be 100 ICBMs by 1960 and 500 by 1961. The wide difference in the two estimates hinged on conflicting views of when the Soviets would be able to begin mass production of their first ICBM, the SS-6. A halt in the Soviet test program, in April 1958, was interpreted by the Air Force as an indication that the missile was ready for deployment, whereas the CIA saw it as evidence that technical difficulties were being experienced in the missile's development. Renewed test launches in 1959 proved the CIA correct.

An entirely separate issue, however, was how many missiles the Soviets would produce each year. Apparently the Air Force picked 500 and the CIA 100 because they were round numbers. Since no one at that time knew the location of Soviet missile manufacturing plants, neither an actual count nor an inference from industrial volume was possible.

Nor did anyone know what a Soviet ICBM

emplacement would look like. The Air Force anticipated camouflaged sites, whereas the CIA argued that the deployment sites would resemble the missile test launchers at Tyuratam. Repeated U-2 flights over Soviet railway lines could not locate any deployed ICBMs, although Air Force Intelligence suspected various buildings to be camouflaged structures hiding missiles. Among these were a Crimean War memorial and a medieval tower. A U.S. photo-reconnaissance satellite took the first clear pictures of a Soviet ICBM site at Plesetsk in August 1960—laid out, as the CIA had predicted, just like the site at Tyuratam. According to the early Air Force projection, the Soviets should have deployed more than 500 ICBMs by this time, but satellite coverage detected no similar sites anywhere else.

The identification of an operational SS-6 site reopened the issue of how quickly the Soviets could produce the missiles. From studies of the Soviet economy and the cost of American ICBMs, the CIA assumed that the Soviets could start off producing ICBMs either on an "orderly" schedule of three per month or on a "crash" program of fifteen per month. Assuming that the Soviets had been producing missiles since 1959, when their test program ended, the CIA calculated that under the orderly schedule the USSR would have 36 operational SS-6s by November 1960, and that they might accelerate production to reach 100 by mid-1961 and 450 by mid-1962. The Air Force, meanwhile, stuck to its original prediction of 500 missiles per year.

The Army and Navy intelligence organizations, whose client services carried on weapons programs that competed with Air Force missiles, pointed out technical deficiencies in the SS-6 tests and expressed doubt that the USSR would ever deploy "more than a few" of these missiles. In August 1961, another successful recovery of satellite film proved them right. Indeed, the Soviets had deployed no more than ten SS-6 missiles, all at Plesetsk. This discovery ended the "missile gap" for good.

The Soviets did have a substantial missile build-up in process—but it was in intermediate-range and not intercontinental missiles. The U.S. intelligence error, again, was one of mistaking Soviet priorities. Between 1958 and 1965, the Soviets deployed about 700 medium- and intermediate-range ballistic missiles (M/

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IRBMs) aimed at Western Europe. This comes to about 100 missiles per year—a figure between the CIA's "orderly" and "crash" estimates of 36 and 180 missiles per year respectively, but far short of the Air Force estimate of 500 per year.

Anti-Ballistic Missiles

Throughout the 1960s, intelligence analysts repeatedly predicted that the Soviets would deploy a nationwide anti-ballistic missile (ABM) system.¹⁴ In the early 1960s, the intelligence community estimated that the Soviets would deploy some 2,000 exo-atmospheric and 8,000 endo-atmospheric interceptors.¹⁵ In 1963–1964, the NIE on strategic defensive forces predicted that before 1975 the Moscow ABM system, just coming under construction, would be expanded to cover every major city with 500 to 1,500 interceptors. Furthermore, between 1964 and 1966, Pentagon analysts suspected that the Tallinn air-defense system would eventually serve as a nationwide ABM and managed to insert this speculation into some NIEs.

After 1967, construction of the Moscow ABM System seemed to halt with only 64 interceptors fielded. Those Tallinn sites were later proved to be for defense against high-altitude bombers. At this point, analysts in the Defense Intelligence Agency (DIA) and John Foster, then the Director of Defense Research and Engineering, speculated that the Tallinn sites could quickly be "upgraded" to a dual purpose SAM/ABM system. Further analysis, however, revealed that many of the Tallinn sites were badly located for ICBM interception, and that they lacked the nuclear warhead storage space essential for a workable ABM system.

Why was U.S. intelligence so eager to detect a Soviet ABM system that never did materialize? Part of this misjudgment was founded on an assessment of Soviet strategic doctrine. The Soviets were greatly concerned about strategic defense. They had an extensive air defense network to intercept bombers, and they had something of a civil defense program. Many intelligence analysts logically concluded that they would construct a comprehensive ABM system as well.

The type of Soviet ABM for which these analysts looked—a combination of exo- and endo-atmospheric interceptors—reflected American

concepts of ABM design, which eventually were realized in the Spartan and Sprint missiles. The Spartan was a comparatively slow missile intended to intercept approaching missiles at or near the peak of their trajectories, when they would be moving at their slowest speed. The fast Sprint would be launched to home in on any reentry vehicles the Spartan might miss. Sprint involved an extremely close radar tracking. Perhaps because the endo-atmospheric approach was so demanding, however, the Soviets chose a different route altogether: an interceptor that would operate at medium altitude (200,000–500,000 feet). From this model, the Soviets developed the Galosh and Griffon interceptors, which used many of the same components.

Galosh was, and is, an ABM. Sixty-four of the interceptors remain deployed around Moscow. However, the Galosh radars use a mechanical means of tracking ICBM warheads, an extremely difficult technique. By 1967, U.S. intelligence analysts began to raise doubts whether the Soviets would ever make further investments in so ineffective a system.

Griffon is the missile deployed in the Tallinn system, now known as the SA-5 surface-to-air missile (SAM). NIE judgments with respect to Griffon's mission wavered from year to year. The Tallinn sites were successors to a system which the Soviets began building around Leningrad in the early 1960s and which the 1963 NIE deemed an "apparent" ABM ("apparent" had been formally established as a codeword in NIEs to indicate that the analysts had little confidence in the given judgment). In 1964, the CIA concluded that Griffon must be an anti-aircraft missile, primarily because its performance was so inferior to Galosh.

On the other hand, Soviet public statements were attributing ABM capabilities to Griffon; Khrushchev said it could hit "a fly in outer space." The Air Force, Army and the DIA were convinced that the CIA was grossly underestimating Griffon's capabilities. The 1965 NIE consequently noted that the intended mission of the Tallinn sites was uncertain, a judgment repeated in 1966.

In bureaucratic terms, Pentagon intelligence analysts had large stakes invested in a Soviet ABM. The Joint Chiefs of Staff, whom DIA represented within the intelligence community, and the Air Force needed the specter of a So-

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viet ABM as a rationale for developing MIRVs (multiple warheads) for U.S. missiles. The Army needed a finding that Soviet ABMs were effective in order to overcome the many doubts about its own ABM program. The analysts could (and did) cite Soviet documents—including classified ones supplied by that premier spy, Penkovskii—to show that the Soviets wanted to build an ABM. They conveniently ignored Soviet documents written after 1965, which expressed grave doubts about the feasibility of ABMs. Those documents had not been obtained clandestinely and as such were dismissed as deliberate Soviet misinformation.

Intelligence analysts were also misled by an assumption about the Soviet military as an eminently rational, far-sighted institution. Many thought the Tallinn system *must* be an ABM—rather than the high-altitude anti-bomber system it was—because it could have no other rational purpose. By that time U.S. bombers were simulating penetrations of Soviet air space at *low* altitude. If Tallinn were a high-altitude system, then the Soviets were building weapons for which there was no mission—an idea thoroughly unpalatable to those who viewed Soviet defense programs as undisturbed by bureaucratic impulses, quirks or mistakes.

The CIA eventually adopted the view that as late as 1967 or 1968 the Soviets still intended to deploy Galosh nationwide, but that improvements in American strategic forces—particularly the MIRV system—convinced them that they needed to go back to the drawing board. This highly doubtful argument salvaged the institutional self-esteem of the Air Force and DIA by validating their argument that the Soviets intended the Galosh and Griffon to be nationwide ABMs, while conceding to the CIA the accuracy of its contention that the Soviets were not deploying an effective ABM system.

Soviet MIRVs

The prospect that the Soviets might place multiple independently targetable warheads (MIRVs) on their ICBMs was first mentioned in the 1965 NIE. The NIE stated it would take four or five years for the Soviets to develop and begin deploying MIRVs that were sufficiently accurate for the destruction of "hardened" (i.e., blast-resistant) targets such as the newly de-

veloped Minuteman ICBM silo. At the time, there was no evidence that any Soviet MIRV program had even begun. Thus the earliest date for Soviet MIRV deployment, inferred from the 1965 NIE, was 1969. In 1966 and 1967, Soviet space shots demonstrated some of the technology necessary for MIRVing. As a result, the Air Force insisted that the NIE contain a judgment that the Soviets were in fact developing a MIRV.¹⁶

In August 1968, the United States observed the first test of the SS-9 "triplet," the three-warhead ICBM. The SS-9 was a very large missile. It was believed that such a missile would be ideally suited to the task of digging out Minuteman silos. However, even the highest estimates of ultimate SS-9 deployments—the Air Force's projection of 700—envisioned a number that was insufficient to destroy 1,000 Minuteman missiles. Thus, analysts who believed that the Soviets were intent upon capabilities to knock out Minuteman reasoned that the Soviets must be planning to place multiple warheads on the SS-9. The triplet tests seemed to confirm this suspicion.

The issue then became whether the triplet was a MIRV or merely an unsophisticated MRV—i.e., whether each of the three warheads could be aimed at a separate target, or whether all three must be aimed at the same general area. Each warhead of the triplet was placed on a rail in the nose-cone of the SS-9. The rails did not rotate to allow repositioning and re-targeting of the warheads. This feature convinced CIA analysts that the SS-9 was simply an MRV. Therefore, the 1968 NIE did not expect a Soviet MIRV until 1978—the end of the period covered by the estimate.

However, analysts outside the intelligence community, most notably in the Pentagon's Directorate of Defense Research and Engineering, noted that the timing of the warhead releases from the SS-9 could cause the warheads to fall in various triangular patterns. They concluded from the pattern of releases during test-flights in the Pacific that the Soviets were indeed adapting these "triangles" (or "footprints") to match the configuration of U.S. missile silos. A missile force of 400 to 700 SS-9s, each with three warheads that could be aimed at three silos, might be very effective against Minuteman after all.

The triplet issue took on all the more impor-

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tance because the Nixon Administration was seeking Congressional approval of the Safeguard ABM system designed to protect Minuteman against Soviet attack. If the SS-9 lacked MIRV capability, then Minuteman needed no protection; if the triangular pattern of the triplet coincided with the distance between three U.S. Minuteman silos, however, then the case for Minuteman vulnerability might still be valid. Furthermore, Henry Kissinger wanted the ABM as a "bargaining chip" in the SALT I negotiations that were just getting underway. Consequently, Kissinger summoned the CIA estimators and the Pentagon DDR&E analysts to the White House for a series of special meetings. From these sessions, Kissinger concluded that the triplet was indeed a primitive MIRV, and he instructed the CIA to rewrite the 1969 NIE to include more evidence supporting both sides of the controversy.¹⁷ (During 1969, therefore, two NIEs on Soviet strategic forces were disseminated: one at the beginning of 1969, which had been prepared the previous year, and one in the fall of 1969 at the new Administration's request.)

In an important sense, the whole argument was artificial. In fact, the Soviets had several programs in parallel: not just an effort to test a primitive MIRV for the SS-9, but also a program to design more sophisticated MIRVs for the next generation of ICBMs. The United States knew nothing about this next generation. Judging by the U.S. decision to stop its own ICBM programs with the third-generation Minuteman, intelligence estimators may have believed that the Soviets would not proceed beyond the SS-9.

In any event, the first 1969 NIE took a wholly different approach to the issue of when the Soviets would be able to deploy a true MIRV. The estimators postulated two possible Soviet approaches: low force/low technology and high force/high technology. The former was based on the assumption that the Soviets would deploy the triplet, not attaining a true MIRV until 1974. The latter assumed the Soviets would skip the triplet and move directly to a MIRV for the SS-9. It was believed that the Soviets, using the technology tested in the space launches of 1966-1967, might be able to begin deploying MIRVs as early as 1971.¹⁸

As it happened, the first Soviet MIRV was deployed on an entirely new, fourth-generation

ICBM in 1975. The Soviets never tried to build a truly MIRVed SS-9. But the intelligence estimates went through various phases. First they overestimated (in 1965 the estimate was 1970), then underestimated (in 1968 the prediction was 1978), then overestimated again (in 1969 the projection was 1971). The varying estimates reflected the different political needs of successive U.S. administrations, as well as a rather vacuous argument over which U.S. terminology (MIRV or MRV) was a more appropriate description of the SS-9 triplet.

The Soviet ICBM Force Size

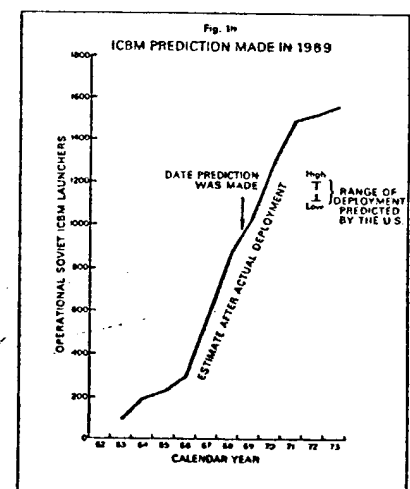
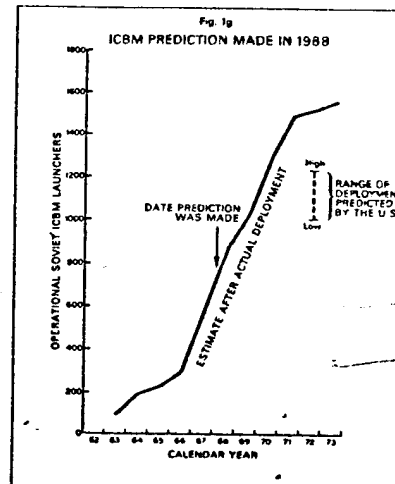
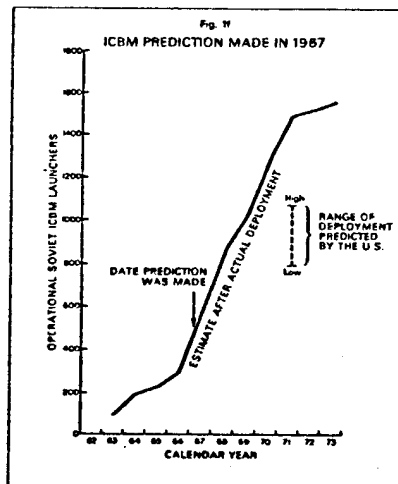
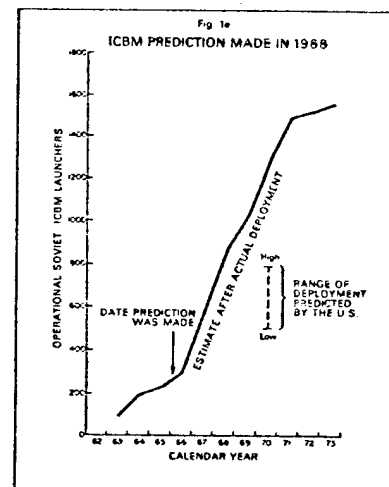
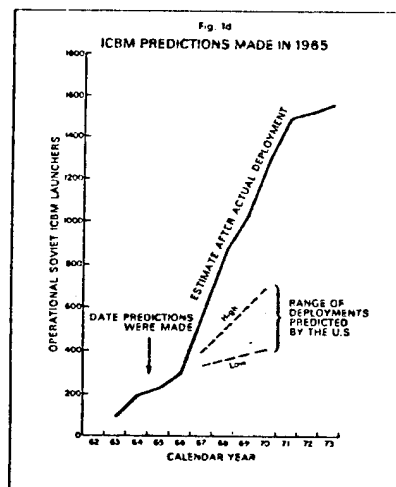
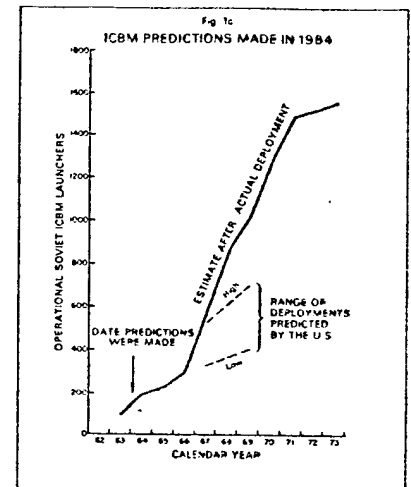
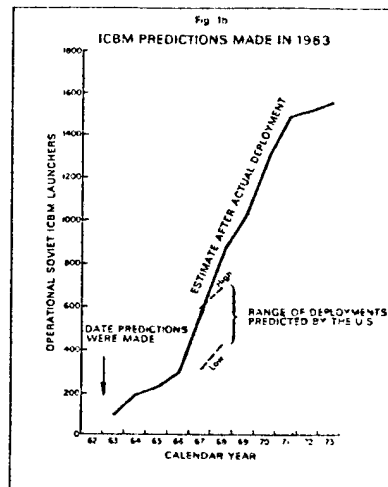
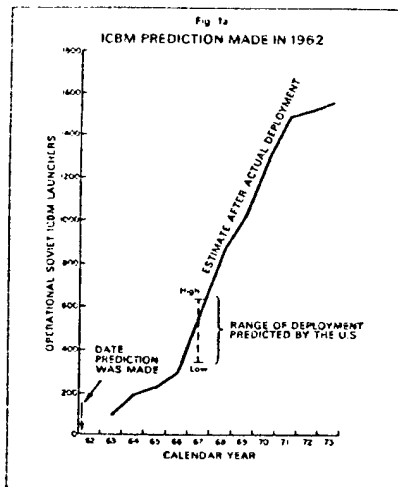
In a series of articles in 1974, the prominent strategic analyst, Albert Wohlstetter, argued that the NIEs between 1962 and 1969 consistently *underestimated* future Soviet strategic offensive capabilities.¹⁹ Wohlstetter's ostensible motive was to challenge the commonly accepted thesis that military intelligence invariably *overestimated* Soviet capabilities to justify its own costly defense programs.

Motives aside, Wohlstetter advanced the idea that these underestimates represented a systematic bias inside the CIA and the intelligence community as a whole—a bias against recognizing the grand scope of Soviet ambitions for ICBM procurement. As the charts on page 36 (reproduced from Wohlstetter's text) indicate, the intelligence agencies did underestimate the number of Soviet ICBM launchers in making projections of future Soviet capabilities. Moreover, as the Soviet build-up accelerated, intelligence projections did not improve; in some cases they even worsened.

Why did this happen? One explanation is that of "mirror-imaging." After 1965, the CIA expected that the Soviets would place MIRVs on their ICBMs just as the United States had done. This expectation led intelligence analysts to project that the Soviets would deploy fewer ICBMs than they finally emplaced. The intelligence community based its estimates on the finding within the United States Defense Department that qualitative improvements to ICBMs were far cheaper ways to gain additional capability than quantitative increases in the force itself. In response to Wohlstetter's charge of underestimation, Lt. Gen. Daniel O. Graham, Director of the DIA, testified in 1975 that "the continuing evidence of qualitative improvement

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Wohlstetter Charts of U.S. Predictions of Soviet ICBMs, 1962-1969



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was a prime contributor to our underestimation of ICBM deployment It seemed logical at the time that the Soviets would try to use their advantage in throw-weight by equipping their ICBMs with MIRVs which could . . . overwhelm the then-programmed U.S. ABM . . . and . . . permit multiple targeting [of U.S. ICBMs]. . . ."²⁰

The Soviets, however, decided instead to build larger numbers of ICBMs. Thus, the CIA did underestimate the number of missile launchers that the Soviets would construct—but it did not massively underestimate the offensive capabilities of the USSR as a whole.

Second, the CIA knew that resources in the USSR were scarce and believed that the major Soviet military investments were going into other Soviet military programs. The CIA during these years vastly overestimated the number of ABMs the Soviets would produce—and this, too, contributed to an underestimation of Soviet ICBM production. In 1962, when small numbers of Soviet ICBMs were predicted, the United States was also anticipating deployment of something like 10,000 ABM interceptors. Defense Secretary Robert S. McNamara suggested in his 1964 Posture Statement that ICBM programs would tend to constrain "large and very costly new programs such as an effective antiballistic missile defense system."²¹ When the intelligence community (incorrectly) concluded that the Soviets were about to deploy a massive ABM network, it was logically reasoned that the Soviets would not build a very large ICBM force. Indeed, the greatest ICBM underestimates, those for 1965 and 1966, coincide with the greatest ABM overestimates.

Third, the general underestimation of Soviet ICBMs included a whopping overestimation of one system in particular, the SS-9. In 1969, DIA projected 420 SS-9s; the Air Force expected as many as 700. In fact, the Soviets never deployed more than 280 and devoted most of their resources to constructing nearly 1,000 smaller SS-11 missiles.²² Had the Soviets gone ahead with SS-9s, the same resources would have purchased something closer to the number of SS-9s predicted by the intelligence community (except for Air Force Intelligence). Thus, in terms of projecting actual offensive capabilities, U.S. intelligence was not so far off the mark as Wohlstetter suggests. Still, the agencies did err in not foreseeing the new Soviet

emphasis on larger numbers of much smaller missiles, which greatly enhanced Soviet power to destroy American industrial and population targets.

Fourth, about 50 per cent of the intelligence community's underestimations, for each year in the late 1960s, is accounted for by the Soviet Union's decision not to retire about 200 obsolete SS-7 and SS-8 ICBMs, contrary to expectations of U.S. intelligence. Thus, when Wohlstetter's chart indicates an underestimate of about 400 ICBMs in 1967, roughly 200 of those were due to an expectation that the Soviets would retire older, more inaccurate missiles.

The lesson to be learned from a closer look at the Wohlstetter study is not, as is now popularly perceived, that the United States has consistently underestimated the offensive capabilities of Soviet missile forces—but rather that, as Wohlstetter himself avers, we underestimated some aspects of that force, overestimated other aspects and made some accurate predictions. Perhaps these cases of optimism and pessimism balanced out when the Defense Department attempted to base its own force planning on these intelligence projections. (For example, McNamara testified that the United States planned forces in the early 1960s under the assumption that the Soviets would mount an enormous ABM capability—a belief that probably more than compensated for the assumption that they would build a relatively small ICBM force.)²³

The intelligence errors on this score appear to be interconnected: low ICBM estimates were directly linked with high ABM estimates. In short, the error is caused not so much by simple counting mistakes as by a misjudgment of *how* the Soviets planned to allocate their defense resources.

Soviet ICBM Accuracy and Yield

Estimating improvements in Soviet ICBM accuracy and explosive yield is today's critically important issue. It is the combination of these two factors that determines the vulnerability of the U.S. force of land-based ICBMs in fixed silos.²⁴

Throughout the 1960s, there was little official concern about the vulnerability of Minuteman. In 1968, Defense Secretary Clark Clifford wrote a memorandum to President Johnson,

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one paragraph of which pointed to the possibility that MIRV deployments of the SS-9 constituted a potential threat to the Minuteman force, and then suggested various solutions to the problem. The Joint Chiefs of Staff convinced Clifford to delete the paragraph.²⁵

The Nixon Administration took Minuteman vulnerability more seriously. If the Soviets could deploy a force of 700 SS-9s, each with triplet warheads (as U.S. intelligence was projecting at the time), they could hypothetically aim two warheads at each of the 1,000 Minuteman silos, thereby ensuring the destruction of nearly all of them. The Office of the Secretary of Defense believed at the time that the Soviets could achieve accuracies of .25 nautical miles CEP (meaning half the warheads would strike within .25 miles of the target point) with the SS-9 triplet by 1974-1975. It calculated that this accuracy, combined with each warhead's estimated 5-megaton yield, would permit the Soviets to knock out 95 per cent of the Minuteman force in a first strike.²⁶

The CIA disagreed. CIA weapons analysts did not believe the "triplet" technology could be improved sufficiently to attain the postulated .25 nautical-mile CEP. The SS-9 triplet had failed to demonstrate accuracy better than .5 nautical miles—not nearly enough, even given the high yields of the Soviet warheads, to destroy missile silos with high probability. In September 1969 the Board of National Estimates therefore drafted a paragraph to the effect that the Soviets could not, and would not try to, achieve a first-strike capability against Minuteman during the 1970s.

However, Secretary of Defense Melvin R. Laird had publicly raised, in open Congressional testimony, the SS-9's threat to Minuteman. Reportedly, Laird's special assistant, William Baroody, went to Central Intelligence Director Richard Helms and asked him to delete the contrary paragraph from the 1969 NIE. Helms complied. When questioned by Senator Frank Church's Senate Intelligence Committee about this matter, Baroody testified that he could not remember "specifically bring[ing] pressures to bear on the Director of Central Intelligence to delete or change any particular paragraph." However, Abbot Smith, then the chairman of the CIA's Board of National Estimates, does recall the episode as the only instance of direct political interference with the

NIEs that he could remember in his twenty years with the agency.²⁷

In April 1971, TRW, Inc. completed a study sponsored jointly by the CIA and DDR&E. It demonstrated that Soviet technology for the SS-9 could not achieve accuracies better than the .5 nautical-mile CEP estimated previously by the CIA—an error factor inadequate for an effective first strike against Minuteman.²⁸ By this time, however, the deployment of Safeguard ABM to defend Minuteman sites had already been authorized.

In 1973, early Soviet testing for fourth-generation ICBM programs (the SS-17, SS-18 and SS-19) reopened the controversy over Minuteman vulnerability. Initial press leaks suggested that the first tests showed accuracies for the new missiles to be little better than the .5 nautical-mile CEP of the older systems. Furthermore, since the new missiles carried more warheads than the SS-9 and had similar or lighter throw-weight, the yields of each warhead would be less than the SS-9's. In short, the warheads would not threaten the Minuteman silos. In response to these reports, a Soviet officer reportedly told U.S. officials during the June 1974 Moscow summit that the United States was underestimating the accuracies of the new missiles. He claimed that .27 nautical-mile CEPs had already been achieved. U.S. analysts doubted this assertion.²⁹

Since that time, intelligence analysts have detected improved performance in Soviet missile accuracy, which—combined with relatively high yields—theoretically does pose a threat to the Minuteman missiles.³⁰ In fact, accuracy cannot be precisely estimated. In June 1979, Walter Pincus reported in the *Washington Post* that the accuracy of Soviet ICBMs was somewhat better than U.S. intelligence had predicted for that time.³¹ However, he also reported that the SS-18 and SS-19 warheads were now judged to have substantially lower yields than had once been projected for them: the analysts had reduced their estimate from 1.5 megatons to about 600 kilotons. The new pessimism in accuracy estimates and the new optimism in yield estimates virtually canceled each other out. This indicates the hazards, and also the importance, of casting precise estimates. (Had the CIA reduced the yield estimates without also accounting for improved accuracy, the perceived vulnerability of Minuteman for the mid-

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1980s would have dropped from 90 to 80 per cent—a perception that might have carried significant policy implications.)

How Good Is Forecasting?

In sum, the record of U.S. intelligence in forecasting future Soviet strategic capabilities is a rather mixed one. Of the eight critical developments which we have examined (See Table 1), the intelligence community overestimated Soviet capabilities on three occasions, underestimated them once, and both over- and underestimated in two cases. The community was almost exactly on target once, and divided between accuracy and underestimation once. The one instance of unmitigated underestimation (in the prediction of the number of Soviet ICBMs) was linked to overestimates of other variables (especially deployment and numbers of Soviet MIRVs and ABMs). The one time when the prediction was nearly dead right (the timing of the first Soviet H-bomb) was a case of fortunate guesswork, based on no hard data.

The record of estimates on Soviet strategic forces bears out Albert Wohlstetter's conclusion: "Our officials sometimes overestimate, and sometimes underestimate, and sometimes even get it right. . . ." ³² This mixed record is obviously due in part to the inherent uncertainties in forecasting. Yet the record suggests certain patterns for mistaken estimates—some common sources of error and some lessons to be learned.

Sources of Error in Strategic Forecasting

As reconnaissance technology has improved over the decades, U.S. intelligence has become more proficient in the science of collecting data. It has more "hard" information about the Soviet military-industrial establishment—missile deployments, production facilities, etc.—and, therefore, a firmer platform from which to make projections.

Yet, few of the mistakes noted in this retrospective have been due to errors in intelligence gathering; most are attributable to mishaps in the far more uncertain art of intelligence analysis. Here is where judgment comes into play—and it seems that, in several instances, misjudgment distorted the view of the future.

There are several principal sources of misjudgment.

Preconceived Notions. It is human to look at the world with preconceived notions—prejudices, excessive attention to some things, insufficient attention to others. These preconceptions shape what we look for and what we believe we see.

Occasionally, these preconceptions limit our vision. President Truman, General Groves and certainly others believed that it would take many years for the Soviets to build an A-bomb because they had a preconceived image of the Russians as technological primitives. With respect to error in forecasts of Soviet ABM, U.S. intelligence fell victim to a preconceived notion of what might be called "extended rationality." The members of the community knew that the Soviets traditionally emphasized defenses in their military program—it followed logically that Moscow would strive for a nationwide ABM. They recognized that the Tallinn site, with its SA-5 missile, was worthless for anti-bomber defenses—therefore, they concluded, assuming Soviet military planners to be flawlessly logical, that it *must* be an ABM system.

Mirror-Imaging. In the absence of obvious facts to the contrary, U.S. intelligence often strays into the assumption that the Soviets conceive of military problems in roughly the same way that American analysts do. This, too, is a natural and understandable human trait. It, too, can mislead.

U.S. intelligence underestimated the number of Soviet ICBMs, for example, because American analysts assumed that the Soviets, like the Americans, would stress quality rather than quantity in the further development of their strategic nuclear forces—specifically, opting for MIRVs on their missiles instead of building more missiles. It was also assumed that, like the United States, the USSR would replace old, obsolescent missiles with new ones. Instead, the Soviets chose a quantitative build-up of their missile forces and did not retire older ICBMs until much later.

Misjudgment of Soviet Strategic Priorities. The "bomber gap" and the "missile gap" were not the unqualified intelligence fiascos that they have been painted to be. The Soviets *did* produce and deploy hundreds of bombers in the late 1950s and hundreds of missiles in the early 1960s. The mistake was in assuming that Mos-

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TABLE 1

U.S. Intelligence: Forecasts vs. Reality

Event	Date Prediction Made	Prediction	Actual	Over: + Under: - Right: 0
Date of Soviet A-Bomb	1945 (Groves) 1945 (scientists) 1949 (intelligence)	1965 1949 1952	1949	- 0 -
Date of Soviet H-Bomb	1950	1954	1953	0
Number of Soviet Long-Range Bombers By 1960 ("Bomber Gap")	1955 (Air Force) 1955 (NIE)	600-700 500	190	+ +
Number of Soviet ICBMs By 1961 ("Missile Gap")	1957 (Air Force) 1957 (CIA)	1,000 500	10	+ +
Number of Soviet ABMs	early 1960s	10,000	64	+
Date of Soviet MIRV Deployment	1965 1968 1969	1970 1978 1971 or 1974	1975	+ - +
Number of Soviet ICBMs *				
By 1967	1964 1965	325-525 330-395	570	- -
By 1970	1965 1966	410-700 505-795	1,299	- -
By 1971	1967	805-1,080	1,513	-
By 1972	1968 1968	1,020-1,251 1,158-1,276	1,527	- -
ICBM Accuracy and Yield				
For SS-9 Accuracy	1969	.25 CEP **	.5 CEP	+
For New Missile Accuracy	1973	.5 CEP	.25 CEP	-
For SS-18/-19 Yield	1978	1.5 Megatons	600 Kilotons	+

* Source: Albert Wohlstetter, *Legends of the Strategic Arms Race*, USSI Report 75-1 (Washington, D.C.: United States Strategic Institute, 1975), p. 24. All other numbers taken from the body of this paper.

** Circular Error Probable, the number of nautical miles from target within which a warhead will land 50 per cent of the time.

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cow would emphasize long-range strategic weapons aimed at the United States. In fact, Soviet strategists decided that areas along the periphery of the USSR—most notably in Western Europe—were the locus of the greatest threat to the Soviet Union, and they accordingly concentrated on the development and production of medium- and intermediate-range weapons. The Eurasian peripheries, after all, represented the historical arena of threats to Russia—and until the 1960s these were the regions where most of the U.S. strategic strike forces were deployed.

In the case of Soviet ICBM forces in the 1960s, U.S. analysts did not underestimate the magnitude of the Soviet defense effort as much as they misjudged Soviet priorities. They believed that the Soviets would go for small numbers of heavy missiles, put more resources into quality than quantity, and emphasize defensive missiles. Thus, the intelligence community projected a large number of SS-9s, low numbers of ICBMs, early deployment of MIRVs and thousands of ABMs. Instead, the Soviets developed only a few hundred SS-9s and about 1,000 smaller SS-11s, took several years longer to field MIRVs, and halted their ABM program after only 64 were deployed.

Political and Bureaucratic Pressure. Intelligence is not practiced in a political vacuum. Direct political interference in National Intelligence Estimates is rare: the reported Baroody case, alluded to earlier, is the only one on record. Nevertheless, intelligence estimates are often highly responsive to the political needs of the client and to the politics of the moment, even when the heavy hand of politics is not visibly applied. The Air Force's need to justify its MIRV program was one factor in its projection that the Soviets would build 10,000 ABM interceptors. Likewise, the Nixon Administration's desire to deploy the Safeguard ABM system was one reason for its initial early estimate of the Soviet MIRV program.

The CIA's underestimation of Soviet ICBM deployments coincided with Defense Secretary Robert McNamara's public testimony that the Soviets would not try to match the U.S. force in number. This was his rationale for resisting pressures to expand U.S. nuclear forces—the level of which, having been arbitrarily set at 1,000 ICBMs, was difficult to justify convincingly as opposed to some equally arbitrary

higher (or, for that matter, lower) level. McNamara did not have to signal CIA analysts directly in order to have his logic reflected in their estimates; they read the newspapers as carefully as the rest of the Washington bureaucracy.

Spurious Learning. Bureaucracy has been defined as an organization that cannot learn from its own mistakes.³³ The intelligence community's record in strategic forecasting bears this out. When the community reacts to previous errors, the lessons it "learns" are often spurious; the community overcompensates for its errors instead of revising the methods that produced them. Thus, overestimates tend to be followed by underestimates, and vice versa.

The underestimates of ICBM deployments in the 1960s were, in part, in response to the overestimates of the late 1950s. CIA officials were determined not to repeat the mistakes of the "missile gap." Similarly, the intelligence community shifted back and forth in its estimate of when the Soviets would deploy MIRVs. First they overestimated (in 1965, the expectation was 1970), then they underestimated (in 1968, the projection was 1978), then overestimated again (in 1969, the projection was 1971). The actual Soviet MIRV deployment came in 1975.

Failure to Use Soviet Sources. The charge that has been leveled against the CIA is that its estimators ignore clear statements of Soviet intentions and capabilities that are often to be found in the open Soviet literature.³⁴ This is a difficult issue to deal with. On some occasions, a heeding of Soviet statements would have made for more accurate intelligence. For example, in a public speech in July 1965, Brezhnev contended that the United States was underestimating the scope of Soviet ICBM programs—which turned out to be true. Similarly, if the CIA had given credence to the statement by the Soviet official that the new Soviet ICBMs had demonstrated a .27 nautical-mile CEP by 1974, the Agency would not have underestimated the rate of improvement in the accuracy of Soviet SS-18 and SS-19 missiles.

Still, some of the Soviet statements are clearly false: an example is Khrushchev's boast that the Soviets had a missile that could hit a fly in outer space. Such statements obviously must be tested against other available intelligence evidence. If the evidence does not match, however, should one then trust one's own esti-

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mates or the statements of a foreign government that has not been noted for its addiction to the truth?

Nobody has proposed a consistent set of rules for determining which Soviet statements are true and which are false. Some analysts follow the rule that any Soviet statement making the USSR appear hostile toward the United States is an accurate representation of Soviet intentions, while any less hostile statement represents a planned deception. This rule is obviously unsatisfactory for intelligence analysis.

Perhaps the CIA has been reluctant to grapple with the complexities of working with Soviet documents. There is no guarantee, in any event, that correction of this deficiency will make intelligence analysis any more accurate or unbiased.

Implications of the Demise of SALT. Looking at the intelligence community from the outside, the public tends to visualize a machine spewing out facts. Rarely does the public realize that the intelligence community is composed of humans in a bureaucracy that is subject to the same pressures and pitfalls as any other.

The problems faced in making accurate forecasts are, of course, grounded first of all in the fact that the Soviet Union is a closed society and does not supply the world's libraries with volumes of public testimony from its generals about military plans. Given the limits on factual information that an intelligence system can draw from any closed society, the intelli-

gence community must rely heavily on its analytical capabilities. This opens the product of the intelligence community wide to a host of human foibles—the preconceived notions, misjudgments, spurious “learning” and other shortcomings that have been discussed above. In fact, given the limited data base upon which the intelligence community must build its projections, it would not have been unreasonable to expect far more errors than have actually been committed.

With increasingly more comprehensive SALT agreements, the intelligence community was finding its tasks made easier. The SALT agreements set concrete numerical ceilings for many categories of measurement of military power. The intelligence community did not have to rely on a murky crystal ball in examining every realm of Soviet activity. The SALT agreements narrowed the analysts' task: in those areas covered by SALT, they needed only to focus their capabilities and efforts on ascertaining whether the Soviets were adhering to their treaty pledges. Resources heretofore devoted to predicting future missile numbers could be devoted to other areas not covered by SALT.

With the death of SALT II, analysts must dust off once again the murky crystal ball. Estimates of future Soviet activity are likely to be wider off the mark than they would be under a SALT II Treaty, simply because the reference points provided by the Treaty have been removed. The human element is maximized, and with it the likelihood of human foibles increases.

NOTES

1. Michael Getler and Robert G. Kaiser, “Intelligence Estimate Said to Show Need for SALT,” *Washington Post*, January 31, 1980.

2. This cuts both ways. Acceptance of the estimate may lead to greater spending in some strategic arms, but it may also lead to rejection of the land-based multiple-shelter basing scheme for the MX missile on grounds that too many shelters would have to be constructed to “absorb” so many Soviet ICBM warheads.

3. The quotes are from Lt. Gen. Daniel O. Graham, former Director of the Defense Intelligence Agency, “Intelligence: Realities and Myth,” *Wall Street Journal*, March 11, 1977, p. 16; George B. Kistiakowsky, “False Alarm: The Story Behind SALT II,” *New York Review of Books*, March 22, 1979. Kistiakowsky was a member of the President's Science Advisory Committee, 1957–1963.

4. See Lawrence Freedman, *U.S. Intelligence and the Soviet Strategic Threat* (Boulder, Colo.: Westview Press, 1977), p. 64; Richard G. Hewlett and Oscar E.

Anderson, *History of the AEC, Vol. I: The New World, 1939–1946* (University Park, Penn.: Pennsylvania State University Press, 1962), pp. 358–360; Herbert York, *The Advisors: Oppenheimer, Teller and the Superbomb* (San Francisco: W.H. Freeman & Co., 1976), pp. 34–36.

6. Cited in Freedman, op. cit., p. 64, and information from D.A. Rosenberg, a researcher studying the U.S. decision to develop the H-bomb.

7. U.S. Senate Select Committee to Study Governmental Operations with Respect to Intelligence Activities (the “Church Committee”), *Final Report, Book IV, Supplementary Detailed Staff Reports on Foreign and Military Intelligence* (Washington, D.C.: Government Printing Office, 1976), p. 56; Freedman, op. cit., p. 67; *The Military Balance, 1975–1976* (London: International Institute for Strategic Studies, 1975), p. 73.

8. For the text of NSC-68, see U.S. Department of State, *Foreign Relations of the United States, 1950, Vol. I: National Security* (Washington, D.C.: Govern-

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ment Printing Office, 1978), pp. 235-292; for the 200-bomb estimate, see p. 251. For a thorough analysis of NSC-68, see Paul Y. Hammond, "NSC-68: Prologue to Rearmament," in Warner R. Schilling, Paul Y. Hammond and Glenn H. Snyder, *Strategy, Politics and Defense Budgets* (New York: Columbia-University Press, 1962).

9. Freedman, op. cit., pp. 65-66.

10. Ibid.

11. Ibid.

12. Even now, the Soviets emphasize medium-range far more than long-range bombers. They have 156 Bear and Bison long-range bombers, compared with 613 Badger medium-range bombers and 80 Backfires that have limited intercontinental capability but are deployed and exercised mainly for "theater" missions. See *The Military Balance, 1979-1980* (London: International Institute for Strategic Studies, 1979), p. 89.

13. This section is based on material in Edgar M. Bottome, *The Missile Gap: A Study of the Formulation of Military and Political Policy* (Cranbury, N.J.: Fairleigh Dickinson University Press, 1971); Freedman, op. cit.; Arnold Horelick and Myron Rush, *Strategic Power and Soviet Foreign Policy* (Chicago: University of Chicago Press, 1966).

14. Material in this section is based on Freedman, op. cit., Chapter 5; Edward R. Jayne II, *The ABM Debate: Strategic Defense and National Security* (Cambridge, Mass.: MIT Center for International Studies, 1969); Ronald Tammen, *MIRV and the Arms Race* (New York: Praeger, 1973).

15. Paul H. Nitze, commenting on articles by Albert Wohlstetter, *Foreign Policy*, Fall 1974, p. 82.

16. See Freedman, op. cit., p. 116.

17. Ibid., pp. 137 ff.; Senate Foreign Relations Committee, Hearings, *Intelligence and the ABM* (1969), p. 24; John Newhouse, *Cold Dawn: The Story of SALT* (New York: Holt, Rinehart & Winston, 1973), p. 161.

18. Melvin R. Laird, Department of Defense, *Fiscal Year 1971 Defense Program and Budget* (February 20, 1970), p. 39.

19. Albert Wohlstetter, "Is There a Strategic Arms Race?" and "Rivals But No Race," *Foreign Policy*, Summer and Fall 1974. These articles were reprinted in *Strategic Review*, Fall 1974 and Winter 1975, and then published together as *Legends of the Strategic Arms Race*, USSI Report 75-1 (Washington, D.C.: United States Strategic Institute, 1975). The Wohlstetter articles sparked a debate involving articles and replies by Paul Nitze, Joseph Alsop, Morton Halperin, Jeremy Stone, Michael Nacht and Johan Holst, in *Foreign Policy*, Fall 1974 and Summer 1975.

20. U.S. Congress, Joint Economic Committee, Hearings, *Allocations of Resources in the Soviet Union and China—1975*, Part I, pp. 97-98.

21. Robert S. McNamara, Department of Defense, *Posture Statement for FY 1964* (February 1963), p. 22.

22. Freedman, op. cit., p. 146.

23. Robert S. McNamara, Department of Defense, *Posture Statement for FY 1967* (1966).

24. An index of vulnerability has been calculated as $Y^{2/3}$ divided by CEP², where Y = weapon yield in megatons, and CEP = Circular Error Probable, or the distance from the target within which a warhead will land 50 per cent of the time. The gist is that increasing yield or accuracy will boost a warhead's "kill probability" against a target, but that doubling accuracy will have the same effect as boosting yield by eight times. See Kosta Tsipis, *Offensive Missiles* (Stockholm: Stockholm International Peace Research Institute, 1974).

25. Newhouse, op. cit., p. 129.

26. Freedman, op. cit., p. 141.

27. See U.S. Senate Select Committee to Study Governmental Operations with Respect to Intelligence Activities ("Church Committee"), *Final Report, Book I, Foreign and Military Intelligence* (Washington, D.C.: Government Printing Office, 1976), pp. 77-79; and Laurence Stern, "Agency Forced to Alter Own Data," *Washington Post*, April 27, 1976.

28. Michael Getler, "Russian Missile Faulted," *Washington Post*, June 17, 1971.

29. Freedman, op. cit., p. 173; U.S. Senate Foreign Relations Committee, Hearings, *Briefings on Counterforce Attacks* (September 1974).

30. According to data released by Paul Nitze, the newest version of the SS-18 (the 10-warhead Mod-4 variant) has a CEP of .17 nautical miles, as does the latest SS-19 with six warheads. See Nitze's testimony, Senate Foreign Relations Committee, Hearings, *The SALT II Treaty* (July 1979), p. 459.

31. Walter Pincus, "U.S. Downgrades Soviet ICBM Yield," *Washington Post*, May 31, 1979.

32. Albert Wohlstetter, *Legends of the Strategic Arms Race*, op. cit., p. 14.

33. Michael Crozier, *The Bureaucratic Phenomenon* (Chicago: University of Chicago Press, 1964).

34. See for example the views of Senator Malcolm Wallop, in U.S. Senate Select Committee on Intelligence, *The National Intelligence Estimates A-B Team Episode Concerning Soviet Strategic Capability and Objectives* (Washington, D.C.: Government Printing Office, February 1978), p. 13.

